REMARKS

Applicants respectfully request the Examiner to reconsider and again examine the claims in accordance with the provisions of 37 C.F.R §1.116.

Claims 1, 2, 4-8 and 10-40 are pending in the application. No Claims are amended by this amendment. Claims 1, 2 and 10-40 are rejected. Claims 3, 9 and 41 have been cancelled by previous amendments. No new claims have been added herein and no claims have been cancelled herein. Claims 1, 17, and 40 are independent claims.

The Examiner again rejects claims 1, 2, 4-8, 10-13 and 17 - 40 under 35 U.S.C. §102(b) as being anticipated by Koyanagi (U.S. Pat. No. 6,525,415). To sustain a rejection under 35 U.S.C. §102(b), a single reference must disclose each and every element of the claimed invention. In this case, as will be explained further herein, the Koyanagi reference fails to describe or suggest a conductive interface which forms at least part of an electrical communication path and **secures** together first and second device layers as called for in each of independent claims 1 and 17. In addition, as also further explained herein, Koyanagi likewise fails to describe or suggest claim 40's recitation of a first conductive **bonding** interface segment disposed between two wafers and which also provides electrical connections between at least some semiconductor elements of the first and second wafers.

In the Office Action, the Examiner equates the "microbumps" in the Koyanagi reference to the "conductive interface" recited in independent claims 1 and 17. Applicants have carefully reviewed and considered the Koyanagi reference, especially regarding the microbumps, and, as explained further below, Applicants again maintain that the primary function of the Koyanagi microbumps is to provide electrical connections, and Applicants further maintain that the Koyanagi microbumps cannot secure substrates together, as recited in claims 1, 17, and 40. Applicants will clarify further herein why this assertion is believed to be incorrect.

First, each of independent Claims 1 and 17 require that the conductive interface form at least part of an electrical communication path and secure together the first and second device layers. Similarly, independent claim 40 requires a first conductive bonding interface segment disposed between two wafers. Applicant's specification further explains at page 10, lines 9-16, that (a) the conductive interface at least couples (i.e., bonds together) the first and second device layers, (b) embodiments of the conductive interface can also electronically and/or photonically interconnect the device layers with each other; and (c) the conductive interface may provide "adhesive and/or bonding properties for securely coupling device layers 20 and 40" (emphasis provided).

Those of skill in the art readily understand what is meant in the claims and specification by the verbs "**secure**" and "**bond**." Specifically, as explained in the American Heritage College Dictionary (3rd Edition, 2000) (hereinafter "AH"), pages 158, and 1233 (copies of which are (hereinafter "RH") attached hereto as Exhibit A) and the Random House College Dictionary (Revised Edition, 1988) to "bond' means "*to join securely, as with glue or cement*"[AH]; "*to connect or bind; to join (two materials)"* [RH] and to "secure" means "*firmly fastened; to make tight or fasten"* [AH], *"to make firm or fast, as by attaching* [RH].

In sharp and direct contrast, Koyanagi states that the first and second substrates are instead tacked together, along the microbumps. This is done prior to being dipped into a fluid epoxy resin, which resin is processed such that it is injected wherever microbumps are absent, then the epoxy is injected around the microbumps then hardened to finally bond the two substrates together (see Koyanagi at col. 9, lines 28-55). It is thus specifically stated in Koyanagi that it is the epoxy (not the microbumps) which bonds the two substrates together. In some instances in Koyanagi, "in order to strengthen the tacking of the micro-bumps 42C and the microbumps 42D, pressure is uniformly applied between the substrates while monitoring the pressure with a load cell." (Koyanagi at col. 10, lines 44-46). However, as those of skill in the

art recognize, tacking, even with pressure, is absolutely NOT the same thing as securing or bonding.

Moreover, Koyanagi NEVER teaches or suggests that this "tacking" is equivalent to or acting as any type of a **secure** fastening, nor does Koyanagi ever teach or suggest that the tacking of the microbumps is sufficient to secure the substrates together. To the contrary, as mentioned above, Koyanagi describes the epoxy as bonding together the two substrates. Koyanagi never provides any unique or special definitions of "tacking," but those of skill in the art readily understand what Koyanagi is referring to by "tacking." Consider the AH and RH definitions of "tack" as shown in the attached Exhibits A and B and listed in part below (at pages 1380 and 137, respectively), and compare them to the aforementioned definitions of "secure" and "bonding" as used in independent claims 1, 17, and 40:

Tack: To fasten or attach with or as if with a tack; to put together loosely or arbitrarily; [AH];
To secure by some slight or temporary fastening; to join together; unite; combine [RH]

Secure: To make tight or fasten; not likely to give way, stable; firmly fastened [AH]
To make firm or fast, as by attaching; dependable; firm; not liable to fail, yield, become displaced, etc., as a support or a fastening [RH].

Bond: To join securely, as with glue or cement [AH];
To connect or bind; to join (two materials); to hold together or cohere, as bricks in a wall or particles in a mass. [RH]

As the above definitions show, attachment by tacking is by definition is nearly the opposite of attachment by securing or attachment by bonding. Koyanagi also recognizes these limitations of tacking. That is why Koyanagi refers specifically to bonding the substrates together with epoxy adhesive (see, e.g., Koyanagi at col. 8, lines 5-21; col. 9, lines 28-55; col. 10,lines 31-55; col. 12, line 58-col. 13, line 4; and col. 14, lines 13-21). That is also why

Koyanagi NEVER teaches or suggests that the tacking of the microbumps is capable, by itself, of securing or bonding the substrates together. Koyanagi instead expressly teaches that:

> "It is also **preferable to bond the first semiconductor substrate to the second semiconductor substrate and the second semiconductor substrate to the third semiconductor substrate by injecting a fluid adhesive into the gaps between the semiconductor substrates**, and an **epoxy adhesive is particularly preferable** as the fluid adhesive. The **use of a fluid adhesive for bonding the semiconductor substrates together** make possible uniform injection of an adhesive between the semiconductor substrates. Among fluid adhesives, epoxy fluid adhesives are highly unlikely to generate bubbles, which would adversely affect the electrical performance of the three-dimensional semiconductor integrated circuit apparatus" (col. 4, lines 33-45.) [emphasis added]

At best, it appears that the tacking of the microbumps is an interim step used to keep the substrates in alignment while the *real* bonding (via the injected and hardened epoxy adhesive) is taking place. Further evidence that Koyanagi is not using microbumps for bonding the substrates together also can be found at col. 11, lines 9-21 and (similarly at col. 14, lines 52-63), where Koyanagi states:

> Although in the foregoing embodiment [FIG. 4] the first integrated circuit and the second integrated circuit are **electrically connected via micro-bumps**, and so are the third integrated circuit and the end of the embedded wiring of the second semiconductor substrate, they may as well be **electrically connected** by some other contact members. Though in this embodiment micro-bumps are formed on both surfaces of the semiconductor substrates and the two semiconductor substrates are bonded together [in FIG. 4, bonded together using epoxy] so that opposite micro-bumps overlap each other, **electrical connection may be accomplished by micro-bumps on only one side** as illustrated in FIG. 5, so that micro-bumps need to be formed on only one of the substrates. [emphasis added]

As the above passage illustrates, Koyanagi states that, for electrical connection, microbumps need to be formed only one substrate. If tacking of microbumps truly were acting (or capable of acting) to secure or bond together the two substrates , as "secure" and "bond" are understood in the art, such "tacking" would be impossible with microbumps formed on only one

of the two substrates. The tacking as Koyanagi describes it requires another microbump to tack to. Consequently, the tacked microbumps of Koyanagi cannot secure or bond together the substrates of Koyanagi, as required by claims 1, 17, and 40. Accordingly, Applicants submit that Koyanagi fails to teach or suggest each and every limitation of claim 1, 17, and 40.

For at least the above reasons, Applicants submit that the rejection of independent claims 1, 17, and 40 under 35 U.S.C. §102(b) is improper and should be removed.

Claims 2, 4-8, 10-13 and 18 - 39 each depend, either directly or indirectly from one of independent claims 1 and 17 and thus include the limitations of either claim 1 or 17, respectively. Accordingly, the rejection of Claims 2, 4-8, 10-13 and 18 - 39 under 35 U.S.C. §102(b) is also improper and should be removed,

The Rejections under 35 U.S.C. §103(a)

The Examiner rejects claims 14-16 under 35 U.S.C. §103(a) as being obvious in view Koyanagi (U.S. Pat. No. 6,525,415) in combination with Nulman (U.S. Pat. No. 5,904,562).

Claims 14-16 each depend either directly or indirectly from base claim 1 and thus include each of the limitations of base claim 1. Accordingly, claims 14-16 each call for a conductive interface, which forms at least part of an electrical communication path and secures together the first and second device layers.

As discussed above, Koyanagi neither describes nor suggests a conductive interface that forms at least part of an electrical communication path and secures together the first and second device layers. Nulman also fails to describe or suggest such an element. Thus, the combination of Koyanagi and Nulman cannot render obvious claims 14 –16 since the combination of the references neither describes nor suggests a conductive interface which forms at least part of an

electrical communication path and secures together the first and second device layers as called for in each of claims 14 –16.

Accordingly, in view of the above Remarks, Applicants submit that Claims 1, 2, 4-8, 10-40 and the entire case are in condition for allowance and should be sent to issue and such action is respectfully requested.

The Examiner is respectfully invited to telephone the undersigning attorney if there are any questions regarding this Response or this application.

Respectfully submitted,

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